

IN THE CLAIMS:

Please amend the claims as follows. A marked-up version of the claims is attached hereto.

1. (Currently Amended) A metal interconnection buried in an insulation film comprising:

an interconnection material containing copper as a main component;

a barrier layer formed between the insulation film and the interconnection material;

and

an adhesion layer ~~containing zirconium~~ of Zr or ZrN formed between the barrier layer and the interconnection material, the adhesion layer being for improving an adhesion between the barrier layer and the interconnection material.



2. (Previously Amended) A metal interconnection buried in an insulation film comprising:

an interconnection material containing copper as a main component;

a barrier layer formed between the insulation film and the interconnection material;

and

an adhesion layer containing zirconium formed between the insulation film and the barrier layer, the adhesion layer being for improving an adhesion between the insulation film and the barrier layer.

3. (Original) A metal interconnection according to claim 1, further comprising:

islands of a copper-zirconium alloy spaced from each other formed between the adhesion layer and the barrier layer.

4. (Original) A metal interconnection according to claim 3,
wherein the islands of the copper-zirconium alloy are formed on the barrier layer,
projected toward the adhesion layer and buried in the adhesion layer in mesh with the
adhesion layer.

5. (Currently Amended) A metal interconnection buried in an insulation film
comprising:

an interconnection material containing copper as a main component;

a barrier layer formed between the insulation film and the interconnection material;

and

an adhesion layer containing a metal material having a solid solubility limit of not more
than 20 wt% in copper and a resistivity increase of not more than 19.8% when solved in
copper formed on the barrier layer and not containing copper, the adhesion layer being for
improving an adhesion between the barrier layer and the interconnection material.

6. (Previously Amended) A semiconductor device comprising:

a base substrate having a semiconductor substrate and a semiconductor element,
formed on the semiconductor substrate;

an insulation film formed on the base substrate, the insulation film having an opening;

and

a metal interconnection formed buried in the opening including:

a metal interconnection material containing copper as a main component;

a barrier layer formed between the insulation film and the interconnection material;

and

an adhesion layer containing zirconium formed between the barrier layer and the
interconnection material, the adhesion layer being for improving an adhesion between the
barrier layer and the interconnection material.

7. (Previously Amended) A semiconductor device comprising:

a base substrate having a semiconductor substrate and a semiconductor element formed on the semiconductor substrate;

an insulation film formed on the base substrate, the insulation film having an opening;
and

a metal interconnection formed buried in the opening including:

a metal interconnection material containing copper as a main component;

a barrier layer formed between the insulation film and the interconnection material;
and

an adhesion layer containing zirconium formed between the insulation film and the barrier layer, the adhesion layer being for improving an adhesion between the insulation film and the barrier layer.

8. (Original) A semiconductor device according to claim 6, further comprising:

islands of a copper-zirconium alloy spaced from each other formed between the barrier layer and the adhesion layer.

9. (Original) A semiconductor device according to claim 6, further comprising:

islands of a copper-zirconium alloy spaced from each other formed in the adhesion layer.

10. (Original) A semiconductor device according to claim 8,
wherein the islands of the copper-zirconium alloy have a thickness of not more than 30 nm.

11. (Original) A semiconductor device according to claim 8,
wherein the islands of the copper-zirconium alloy have a diameter of not more than
20 nm.

12. (Original) A semiconductor device according to claim 8,
wherein the islands of the copper-zirconium alloy are spaced from each other at a
space of not less than 2 nm and not more than 20 nm.

13. (Original) A semiconductor device according to claim 6,
wherein the opening includes an interconnection groove and a via hole opened in
the interconnection groove.

14. (Previously Amended) A method for forming a metal interconnection buried in
an insulation film, comprising the steps of:

forming a barrier layer on the insulation film;
forming an adhesion layer containing zirconium directly on the barrier layer; and
forming an interconnection material containing copper as a main component on the
adhesion layer.

15. (Previously Amended) A method for forming a metal interconnection buried in
an insulation film, comprising the steps of:

forming an adhesion layer containing zirconium on the insulation film;
forming a barrier layer directly on the adhesion layer; and
forming an interconnection material containing copper as a main component on
the barrier layer.

16. (Original) A method for forming a metal interconnection according to claim 14, further comprising, after the step of forming the barrier layer, the step of forming islands of copper as a main component spaced from each other on the barrier layer.

17. (Previously Amended) A method for fabricating a semiconductor device comprising the steps of:

forming an insulation film on the base substrate having a semiconductor substrate and a semiconductor element formed on the semiconductor substrate;

selectively removing the insulation film to form an opening in the insulation film;

forming a barrier layer on the insulation film and a region where the opening is formed;

forming a first adhesion layer containing zirconium directly on the barrier layer;

forming an interconnection material containing copper as a main component on the first adhesion layer so as to fill the opening; and

removing the interconnection material, the first adhesion layer and the barrier layer by polishing the same until the insulation film is exposed to form the metal interconnection of the interconnection material, the first adhesion layer and the barrier layer buried in the opening.

18. (Original) A method for fabricating a semiconductor device according to claim 17, further comprising, after the step of forming the barrier layer, the step of forming islands of copper as a main component spaced from each other on the barrier layer.

19. (Original) A method for fabricating a semiconductor device according to claim 18, further comprising, before the step of forming the islands, the step of forming the second adhesion layer containing zirconium on the barrier layer.

20. (Original) A method for fabricating a semiconductor device according to

claim 17, further comprising the steps of:

forming a seed layer of copper as a main component on the adhesion layer; and
subjecting the semiconductor substrate to a heat treatment to diffuse zirconium in the adhesion layer into the seed layer.

21. (Original) A method for fabricating a semiconductor device according to claim 18, further comprising the steps of:

forming a seed layer of copper as a main component on the adhesion layer; and
subjecting the semiconductor substrate to a heat treatment to diffuse the zirconium in the adhesion layer into the seed layer and the islands.

22. (Previously Amended) A method for fabricating a semiconductor device comprising the steps of:

forming an insulation film on the base substrate having a semiconductor substrate and a semiconductor element formed on the semiconductor substrate;

selectively removing the insulation film to form an opening in the insulation film;

forming an adhesion layer containing zirconium on the insulation film and a region where the opening is formed;

forming a barrier layer directly on the adhesion layer;

forming an interconnection material containing copper as a main component on the barrier layer so as to fill the opening; and

removing the interconnection material, the barrier layer and the adhesion layer by polishing the same until the insulation film is exposed to form the metal interconnection of the interconnection material, barrier layer and the adhesion layer buried in the opening.

23. (Original) A method for fabricating a semiconductor device according to claim 18,

wherein in the step of forming islands, the islands are formed in a thickness of not more than 30 nm.

24. (Original) A method for fabricating a semiconductor device according to claim 18,

wherein in the step of forming islands, the islands are formed in a diameter of not more than 20 nm.

25. (Original) A method for fabricating a semiconductor device according to claim 18,

wherein in the step of forming islands, the islands are formed, spaced from each other by a space of not less than 2 nm and not more than 20 nm.

26. (Previously Added) A metal interconnection according to claim 5, wherein, the metal material is comprised of at least one material selected from the group consisting of Zr, Cd, Ag and Pb.
